

November, while in Brazil it commences in May and ends in September.

Though the broad principles of the preparation of coffee for market are well known, the description here given, especially aided as it is by the practical illustrations, will be of especial value. No book on coffee could possibly be complete without a reference to the diseases to which the plant is subject, whether the disease belongs to the vegetable or animal kingdom. Consequently we find thirty-one pages devoted to this part of the subject. Substitutes for coffee also come under consideration, occupying, however, a comparatively small space, and though no doubt sufficient is said about them, their number might be considerably increased. Perhaps one of the most interesting parts of the book is that treating on production, in which each country is considered separately, the first chapter being devoted to the American Continent, and naturally leading off with Brazil. British, Dutch and French Guiana are also considered, and comparisons made with product and export, as are also those of Paraguay, Venezuela, Columbia, Costa Rica, Mexico and other places. The West Indies, including Jamaica, Porto Rico, Trinidad and other important coffee growing countries, as well as the Eastern countries and Africa, are also referred to. This part of the subject is practically illustrated by a map of the world, showing at a glance the geographical distribution of the coffee plant, together with the production of each country in kilogrammes, and the date to which the figures refer. A comparison of the produce of each country is readily gained by a series of disks of different sizes, with the names of the country beneath each, and the total in figures; from this it will be seen that Brazil is far ahead of any other individual country. An interesting table is also given showing the consumption of coffee in the principal countries of the world, from which it seems that of the European countries Germany consumes by far the largest quantity. The figures in tons for 1897 standing thus—Germany 136,390, France 77,310, England 12,420, while the consumption in the U.S. of America in the same year amounted to 318,170 tons. The book concludes with a table of subjects of the several chapters, but lacks that most necessary adjunct of all books—a good index.

#### THE BIRDS OF SURREY.

*The Birds of Surrey.* By J. A. Bucknill. Pp. lvi + 374, illustrated. (London: R. H. Porter, 1900.)

FROM its great extent of open moorland and the presence of several large sheets of water, Surrey occupies an unusually favourable position among the metropolitan counties for the development of a large bird-fauna; and since a very considerable portion of the county is now undergoing a metamorphosis under the hands of the builder as the area of the metropolis and its suburbs increase, it is most important that a full record should be secured of the species of birds which are fast disappearing from its limits. The compiling of such records, and the careful working out of the past history of locally distributed species within the limits treated of, seem, indeed, to be the chief justification for the publication of county ornithologies. And in this respect, as well as in the careful collection of local bird-

names, the author of the work before us appears to have discharged his task in a thoroughly satisfactory manner. An instance of this is afforded by his account of the occurrence of the black-grouse in Surrey. To many of our readers it will probably come as a surprise to learn that black-cock shooting was a recognised sport on the Surrey moors during the forties, and even to a considerably later date. At the present day there is, however, scarcely a single genuine wild bird of this species to be met with in the county; and the excellent history of its gradual extermination given by Mr. Bucknill should, therefore, be read with the greatest interest alike by sportsmen and by ornithologists. The raven, the buzzard, the marsh-harrier, and the dotterel are other species which have disappeared from the county, either totally or as nesting birds; the last record of the occurrence of the dotterel being 1845, when a couple of specimens were purchased from the landlord of an inn at Hindhead.

Of the numerous rare birds that have been noticed from time to time in the county, the great majority have been visitors to the well-known Frensham ponds, the larger of which extends into Hampshire. Here we are practically in Gilbert White's country; and in these favoured haunts have been seen the osprey, the spoonbill, several of the rarer kinds of duck, the goosander, and the purple heron. Sad to say, the arrival of these wanderers has for the most part been speedily followed by their slaughter; and, as the author remarks, hundreds of other avian rarities have doubtless been killed and eaten without record. Unhappily, the great increase in game preservation which has taken place of late years in the county appears to have been the cause of the diminution in the numbers of many of the rarer species of birds. But there are many country gentlemen, on the other hand, who are lovers of natural history, and who veto as much as possible the bird-slaying propensities of their gamekeepers. It is to such, and to the laws now in force for the protection of wild birds, that we have to look for the commencement of a better state of things in the wilder parts of the county. And the fact that the golden oriole and the hoopoe have been observed of late years on several occasions indicates the probability that these beautiful birds would once more nest in the Surrey groves if only they received adequate protection.

A feature of the book is the beautiful series of illustrations of Surrey scenery; the views of Frensham Great Pond and of the Surrey Weald being some of the best examples of landscape photogravure that have come under our notice. Although primarily intended for residents in the county (among whom we are glad to see that a long list of subscribers has been enrolled), the book is full of interest to all bird-lovers living in the south of England. R. L.

#### OUR BOOK SHELF.

*Untersuchungen ueber d. Vermehrung d. Laubmoose durch Brutorgane und Stecklinge.* Von Dr. Carl Correns, a.ö. Prof. d. Botanik in Tübingen. Pp. xxiv+472; mit 187 abbild. (Jena: Verlag v. Gustav Fischer, 1899.)

FEW people perhaps fully realise how abundantly the mosses are provided with modes of vegetative reproduction, even although they may be fully cognisant of the fact that the protonema—the precursor of the moss-

plant—is readily induced to make its appearance from the cut ends of the stems and leaves of these plants. Prof. Correns has done a useful service in bringing together, in a classified manner, the numerous methods employed by mosses to ensure their propagation and dispersal by means less expensive than by the production of spores. The readily friable stems of some species of *Andreaea*, the easily detached branchlets of *Dicranum*, are instances, well known to muscologists, of a large class of propagative bodies. These simpler forms of reproduction are also widely spread amongst plants other than mosses, and in some cases—e.g. *Lycopodium Selago*—the superficial resemblance is rather striking. Less obvious are the subterranean bulbils or buds, such as are met with in *Dicranella*, *Baibula*, or *Funaria*, in which special tuberous bodies are formed. *Dicranella heteromalla* affords a pretty example of a form transitional from the simple to the more complex types, inasmuch as the subterraneous bulbils of this moss are little more than rows of swollen rhizoid-cells arranged somewhat like a string of beads. Many of these bulbils are regarded by Correns rather as of the nature of food reservoirs than as brood bodies; but it is at least certain that they are in most cases able to function in the latter capacity as well as in that of mere storehouses of food-reserves.

Other and very common cases of brood bodies are afforded by the so-called "*folia fragilia*"—leaves which readily become detached from the parent plant, and with greater or less intervention of protonematal filaments give birth to new individuals. Oftentimes the leaves destined to this end undergo considerable contraction in size, and, indeed, may assume a totally rudimentary appearance.

Again, as in some species of *Orthotrichum*, cells grow out from the ends of leaves, and the sausage-shaped proliferations, after detachment from the parent plant, grow out to filaments, on which new plants arise.

The above are only a few of the many forms cited by Correns of gametophytic reproductions in the mosses by vegetative means. But as Pringsheim long ago pointed out, it is also possible to reproduce these plants from the sporophyte generation, especially from cut fragments of the seta or stalk of the moss-capsule. These are far more interesting, as they resemble the curious aposporic development met with in a number of ferns. Indeed, these latter offer, perhaps, a means of attacking the details of the phenomena of apospory with a greater chance of success than in the case of the ferns, since they seem more easily induced by simpler experimental devices than is the case with the higher plants.

A general synopsis of the various types and forms of brood-bodies forms a useful adjunct to the main descriptive part of a book on which the author has evidently expended much labour, and which should earn for him the gratitude of all those muscologists who are not merely describers of species, as well as of botanists who seem too often rather to be disposed to ignore an important section of the vegetable kingdom.

*Village Notes, and Some Other Papers.* By Pamela Tennant. Pp. xii + 204; 13 plates. (London William Heinemann, 1900.)

THESE notes reveal some of the humour and pathos of rural life in South Wilts, and here and there they lightly touch natural scenes and objects other than human. The plates, which are reproductions from original photographs of Wiltshire views, are excellent, and the book itself is a dainty volume suitable for a drawing room table. Reference is made to the "pernicious habit of 'underlining' in their letters" which some people adopt, yet we notice an abundance of italicised words in the book, and they are equivalent to the underlined words so severely condemned.

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### LETTERS TO THE EDITOR.

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#### The Conductivity produced in Gases by the Motion of Negatively-charged Ions.

RECENT researches have shown that gases are rendered conductors of electricity when negatively-charged ions move through them with a high velocity. Thus the cathode rays and the Lenard rays possess the property of ionising gases through which they pass (J. J. Thomson, "The Discharge of Electricity through Gases"). Becquerel (*Comptes rendus*, March 26, 1900) also has recently shown that the conductivity produced by radium is due to small negatively-charged particles given off by the radio-active substance. In these cases the charged particles which ionise the gas move with velocities nearly equal to the velocity of light.

Some experiments which I have recently made show that ions which are produced in air by the action of Röntgen rays will produce other ions when they move through the gas with a velocity which is small compared with the velocity of light.

When Röntgen rays are sent through a gas, at atmospheric pressure, the current between two electrodes immersed in the gas increases in proportion to the electric force, when the force is small. For large forces the current attains a value which is practically constant.

When the pressure of the gas is reduced, the connection between conductivity and electromotive force is more complicated. The accompanying tables show the connection between current and electric force for air at 2 and 8 mm. pressure. At these pressures the current is practically constant for forces of about 10 volts per centimetre, and when forces of this order are acting, all the ions are produced directly by the rays. When the electric force is increased these ions produce others, so that the current again increases.

It appears from the following investigation that the new ions are produced by the collisions between negatively-charged ions and the molecules of the gas.

Let us suppose that  $n$  negative ions are moving in a gas between two parallel plates at a distance  $d$  apart. Let  $X$  be the electric force between the plates ( $= \frac{V_1 - V_2}{d}$ ), and  $p$  the pressure of the gas. In going a distance  $dx$  the  $n$  ions produce  $\alpha \times n \times dx$  others, where  $\alpha$  is a constant depending on  $X$ ,  $p$ , and the temperature, which is constant in these experiments. (The coefficient  $\alpha$  is practically zero for small values of  $X$ , unless  $p$  is also small).

$$\therefore \frac{dn}{n} = \alpha dx$$

$$\text{and } n = n_0 E^{\alpha x}$$

Hence  $n_0$  ions starting at a distance  $x$  from one of the plates will give rise to  $n_0(E^{\alpha x} - 1)$  others. When the ions arrive at the plate, the formation of new ions ceases and the current stops, although the electromotive force is kept on. Let  $n_0$  be the number per unit volume produced by the rays. The total number of ions produced will therefore be

$$\int_0^d n_0 E^{\alpha x} dx = \frac{n_0}{\alpha} (E^{\alpha d} - 1)$$

per unit area,  $n_0 d$  being the number produced by the rays. Hence

$$\frac{c}{c_0} = \frac{1}{\alpha d} (E^{\alpha d} - 1)$$

where  $c$  is the current for a large force  $X$ , and  $c_0$  the current composed of ions produced by the rays.

The following experiments were made in order to test the accuracy of this formula for currents produced between two parallel plates whose distance apart could be varied.

The rays fell normally on one of the plates, which was made of thin aluminium, and after passing through the air between the plates, the rays were completely stopped by the second plate, which was of brass. The plates were 10 centimetres in diameter, and the rays were allowed to fall on a circular area at the centre 4 centimetres in diameter. The conductivity was thus confined to a region where the force was constant. A large part of the conductivity ( $c_0$ ) arises from the secondary radiation from the brass disc. At high pressures the secondary